U.S. AIR FORCE

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Occupational Jet Fuel Exposure and Invasive Cancer Occurrence

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Sustaining Readiness through Healthy Communities

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Background

- JP-8 is the primary aircraft, vehicle and equipment fuel used in the USAF
- Jet fuel is the greatest source of chemical exposure for these personnel
- Among fuel-exposed workers
  - Acute adverse health effects have been well-documented
  - Long-term effects have not been widely studied

Purpose

- To conduct an exploratory study measuring the association between occupational jet fuel exposure and invasive cancer occurrence in USAF personnel
- USAF is an ideal population for data records analysis because of the detailed information that is routinely collected
  - Automated Central Tumor Registry (ACTUR)
  - Air Force Personnel Center

Methodology

Nested Case-Control Study Design

USAF personnel with ≥1 year active duty between 1 Jan 88 and 31 Dec 03

CASES
USAF diagnosed with cancer between 1 Jan 89 and 31 Dec 03 (2,754 people)

compared to

CONTROLS
USAF with same year of birth, race and gender as each respective case (11,016 people)

Total Sample = 13,770

Exposure Assessment

- Categorized based on current and previous USAF occupations:
  - **High** (N=45)
    - Aircraft fuel systems workers
    - Direct and frequent fuel contact
  - **Moderate** (N=428)
    - Fuel storage and distribution systems
    - Indirect and/or intermittent fuel contact
  - **Low** (N=13,297)
    - All other occupations
    - Little or no fuel contact

Fuel Systems Workers

Sample Characteristics

Distribution of Select Sample Characteristics		
AGE AT DIAGNOSIS	Range Median	18 - 61 years 37 years
GENDER	Female Male	27.1% 72.9%
RACE	White (Hispanic & Non-Hispanic) Black Other	84.6% 11.4% 3.2%

Sample Characteristics

Distribution of Jet Fuel Exposure Levels			
Level of Occupational Jet Fuel Exposure	Cases %	Controls %	Total %
High	0.3	0.3	0.3
Moderate	2.7	3.2	3.1
Low	97.0	96.5	96.6

Results

Jet Fuel Exposure and Odds Ratio for Cancer			
Level of Occupational Jet Fuel Exposure	Odds Ratio	95% CI	p-value
High	0.73	0.32-1.64	0.44
Moderate	0.84	0.65-1.09	0.19
Low	Reference	--	--
Exposed	0.83	0.65-1.06	0.14
Unexposed	Reference	--	--

Specific Cancer Types

Cancer Type	Cases N	OR	95% CI
Acute Myeloid Leukemia	26	0.48	0.06-4.01
All Leukemias	71	0.55	0.12-2.52
Urinary Bladder	48	0.70	0.10-5.07
Breast Adenocarcinoma	217	0.49	0.11-2.17
Hodgkin's Lymphoma	135	0.44	0.10-1.91
Lung (Small & Non-Small cell)	42	0.79	0.09-7.28
Multiple Myeloma	17	1.33	0.14-12.82
Non-Hodgkin Lymphoma	145	1.00	0.33-3.03
Renal Clear Cell	49	0.83	0.21-3.32

Frequencies were too small for valid comparisons of ALL, CLL, CML, dermatofibrosarcoma, hepatocellular and nasal cancers

Discussion - Strengths

- All data were abstracted from surveillance databases that utilized standardized reporting procedures
  - Minimizes chance of recall bias
  - All cancer cases analyzed, coded and entered by trained registrars
- Novel study
  - Addresses gap in the literature and may be useful for future work

Discussion - Limitations

- Individual exposure assessment
- Analysis of specific fuels/chemicals
- Adjust for other cancer risk factors
- Healthy worker effect
- Small number of some cancer types

Discussion - Improvements

- Environmental Sampling
- Biological Markers
- Personal Surveys/Questionnaires
- Measure a more prevalent and/or earlier onset outcome

Conclusion

- No association observed between occupational jet fuel exposure and invasive cancer occurrence
  - Similar findings reported in other studies
- No red flags

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Questions?